at work throughout every clear night. The number of photographs obtained is 1155. The objects photographed are selected from a list of 625 double stars, 143 clusters and other celestial bodies, such as the moon and planets. As these same objects have been repeatedly photographed at Cambridge with the same instrument, an accurate comparison of the atmospheric conditions of the two places may be made. It will of course be impossible to derive a final conclusion until the observations have extended over at least a year, but the evidence already secured shows that in summer results can be obtained at Wilson's Peak which cannot be obtained here. The difference is very pronounced for such objects as the markings on Jupiter. Clusters like that in Hercules are well resolved, so that the individual stars are easily measured, which cannot be done with the best Cambridge photographs. As a test-object the sixth star in the trapezium of the Orion nebula is clearly photographed for the first time. A new variable star has been discovered in the midst of the cluster G. C. 3636. A beginning has been made of the measurements of the position and brightness of the double stars, and it is hoped to extend this work to the clusters, and thus furnish an extensive addition to this department of micrometic astronomy.

Much experimental work has also been done at Cambridge, as is shown by the fact that nearly a thousand photographs have also been taken there. Moreover, the expedition to Peru is largely supported by the Boyden Fund. The meridian photometer will be used to extend two large series of observations to the south pole. These are the "Harvard Photometry," and the zones used in the revision of the *Durchmusterung*. This work will furnish photometric magnitudes of stars as bright as the ninth magnitude in all parts of the sky. The Messrs. Bailey have observed 67 series, one of them including 293 stars. In all, during less than six months, about 6700 stars have been observed, which have required 26,800 settings.

The Bruce Photographic Telescope.—For the last six years experiments have been in progress here on the use of a photographic doublet in the preparation of maps of the stars. The eight-inch telescope now in Peru is of this form and was mounted here in 1885. Since then 4500 photographs have been taken with it. With an exposure of an hour twice as many stars can be photographed as are visible with a telescope having an aperture of fifteen inches, and as many stars as can be photographed in the same time with a telescope of the usual form having an aperture of thirteen inches. Moreover with a doublet a portion of the sky covering twenty-five square degrees can be photographed with good definition, while only three or four degrees can be covered equally well with telescopes of the usual form. The time required to photograph the entire sky will be reduced in the same proportion. With a doublet each hemisphere could be covered in one year with eight hundred plates. In 1885 it was proposed to photograph the entire sky with the eight-inch telescope, enlarging the plates three times. The results would resemble in scale and size the charts of Peters and Chacornac. The generous aid of Miss Bruce mentioned above will permit this result to be attained in the original photographs, without enlargement. A contract has been made with Messrs. Alvan Clark and Sons for a telescope having an aperture of twenty-four inches and a focal length of eleven feet. Meanwhile nineteen foreign Observatories have united in an Astrophotographic Congress to prepare a map of the stars to the fourteenth magnitude with telescopes of the usual form having apertures of thirteen inches. The plans have been matured with great care and skill. The courteous reference to the Bruce telescope and its proposed work by Admiral Mouchez shows that both plans can be carried out without disadvantageous duplication. Doubtless each plan will possess certain advantages over the other. The Bruce telescope will be especially adapted to studying the very faint stars. It is hoped that those of the sixteenth magnitude and fainter can be photographed. Its principal use will probably be for the study of the distribution of the stars, for complete catalogues of clusters, nebulæ, and double stars, and for the spectra of faint stars. The amount of material accumulated will be enormous, and the best method of discussion will form a very difficult and important problem.

NOTES.

THE bulletins relating to the health of Sir Richard Owen, who is suffering from a paralytic stroke, have called forth many expressions of sympathy from the general public, as well as from men of science. Hopes of his recovery are entertained, but at his advanced age the process must necessarily be slow.

A CIRCULAR letter from the Conseil Général des Facultés de Montpellier, issued March 1, 1890, and addressed to the chief learned bodies, sets forth that on October 26, 1289, a Bull of Pope Nicolas IV. "érigeait en *Studium generale* les Facultés de Droit, de Médecine et des Arts, qui existaient déjà depuis longtemps dans notre ville." It is proposed, therefore, as we have already noted, that during the present year the University shall commemorate its entry upon its seventh century. The *fête* will probably be held towards the end of May.

AFTER the reading of the papers at the ordinary meeting of the Royal Meteorological Society on Wednesday, March 19, the Fellows and their friends will have an opportunity of inspecting the Exhibition of Instruments illustrating the application of photography to meteorology, and of such new instruments as have been invented and first constructed since the last Exhibition. The Exhibition will, at the request of the Secretary of the Institution of Civil Engineers, be open in readiness for their meeting on Tuesday evening the 18th instant, and will remain open till Friday the 21st instant.

AN International Exhibition of Mining and Metallurgy will be held this year at the Crystal Palace from July 2 to September 30. The Lord Mayor is the patron, the Duke of Fife the Hon. President, and the list of Hon. Vice-Presidents contains the names of Lord Wharncliffe, Lord Brassey, Lord Thurlow, Sir Frederick Abel, Sir Alexander Armstrong, Sir F. Dillon Bell, Sir Graham Berry, Sir Charles Clifford, Sir James Kitson, Sir Roper Lethbridge, M.P., Sir John Lubbock, M.P., Sir John Pender, Sir E. J. Reed, M.P., Sir Saul Samuel, Sir Warington W. Smyth, Sir Charles Tennant, M.P., Sir Edward Thornton, Sir Charles Tupper, Sir H. Hussey Vivian, and Prof. Roberts-Austen. Mr. Pritchard Morgan, M.P., is chairman, and Mr. Henry Cribb deputy-chairman of the Executive Council, which consists of 20 gentlemen well known in engineering and mining matters. The following are the subjects likely to be included within the scope of the Exhibition:—Machinery, mining in gold and silver, diamonds and precious stones, ironstone and iron-ore mining, the manufacture of iron and steel, lead, tin, copper, and coal mining, petroleum and salt industries, and a number of other kindred subjects. Ambulance practice and the condition of miners will also be illustrated.

A GENERAL meeting of the Society for the Preservation of Ancient Monuments in Egypt will be held at the rooms of the Royal Archæological Institute to-morrow (Friday), at 5 p.m. Attention will be specially called to the wanton excision of portions of the well-known fresco paintings in the tomb of the Colossus on a sledge, dating from the Twelfth Dynasty, or between 2000 and 3000 years B.C., at Der-el-Barsha, the chipping out of cartouches of different Sovereigns from the Sixth

Dynasty tombs at the same place, the mutilations of tombs at Beni Hassan, the malicious removal of curious bas-reliefs at Tel-el-Armana, and other recent acts of vandalism. Such outrages as these ought surely to be made practically impossible. All that is needed is that the matter shall be seriously taken in hand by the Foreign Office.

AN attempt is being made by the Society of Antiquaries of London to raise a fund, the interest of which shall be used from time to time to defray the expense of excavations, or to advance archæological knowledge in such other ways as may seem suitable to the President and Council of the Society. The object is one which ought to commend itself to all who interest themselves in archæology. The Society wants a capital sum of only £3000. Subscriptions should be sent to the treasurer, Dr. E. Freshfield, 5 Bank Buildings, E.C.

MR. GLADSTONE has consented to open the new Residential Medical College at Guy's Hospital on Wednesday, March 26, at 2 p.m.

THE treasures of the Ruskin Museum at Sheffield are being transferred from the small building at Walkley, in which they have hitherto been kept, to more convenient premises. The Museum will be reopened by Lord Carlisle on July 15.

THE March number of the *Kew Bulletin* opens with an account of Indian Yellow, or Purree, about the origin of which there used to be much uncertainty. Some time ago, in consequence of inquiries made in India at the request of the authorities at Kew, the mystery was cleared up; and full information on the subject will be found in the present paper. Another paper deals with Bombay aloe fibre, and there are sections on the commercial value of loxa bark, and on barilla.

AN industrial and artistic Exhibition will shortly be opened in Ouéno, the most beautiful park in Tokio. M. de Lezey, writing to *La Nature* on the subject from Tokio, says that the Exhibition will be particularly rich in collections of Japanese antiquities.

ON February 22 the Johns Hopkins University celebrated the twelfth anniversary of its opening. It was announced that, of the various pressing needs of the University for expansion, that of the chemical laboratory was to be met by turning over to it for reconstruction the ill-ventilated Hopkins Hall.

THE collections belonging to the Academy of Natural Sciences of Philadelphia grow so rapidly that the accommodation provided for them is wholly inadequate. A new building is to be erected, and the State Legislature has voted $50,000 as a contribution towards the expenditure. It is hoped that another "appropriation" of the same amount will be made, and that the rest of the money required will be privately subscribed.

GERMAN papers announce the death of Dr. Karl Emil von Schafhäutl, Professor of Geology, Mining, and Metallurgy at Munich University, keeper of the geognostic collection of the Bavarian State, and member of the Academy of Sciences. He was not only an eminent physicist and geologist, but also a theoretical musician of some note. He was born at Ingolstadt on February 26, 1803, and died at Munich on February 25 last.

THE death of Victor, Ritter von Zepharovich, is also announced. He was Professor of Mineralogy at the German University of Prague, a member of the Academy of Sciences at Vienna, and author of the "Mineralogical Dictionary of the Austrian Empire," and many valuable mineralogical and crystallographical works. He was born at Vienna on April 13, 1830, and died at Prague on February 24 last.

ON Tuesday evening, Dr. Dallinger delivered an interesting lecture at the Royal Victoria Hall, on "The Infinitely Great and the Infinitely Small," to an audience numbering about 400, composed principally of working men. The lecture was illustrated by numerous lantern-views, and was evidently much appreciated.

IN the *Engineer* of the 7th inst., there is an excellent article on the latest express compound locomotive on the North-Eastern Railway. This engine is for the east coast Scotch traffic on the section between Newcastle and Edinburgh—about 125 miles. A trial was made with a train of thirty-two coaches (total weight of train 270 tons) between Newcastle and Berwick, a distance of sixty-seven miles; and the time was seventy-eight minutes, or three minutes less than the Scotch express. With the heaviest loads an assistant engine will not be necessary. In another trial with a special train of eighteen six-wheeled coaches, a speed of about ninety miles per hour was obtained. This is the highest recorded speed by several miles. Diagrams were taken at various speeds, one set at a speed of eighty-six miles per hour on the level. This speed was carefully measured by stop-watch and mile-posts; the highest speed observed was just over ten seconds per quarter mile run. It is evident from these facts that passengers to the north will not waste much time on the journey when the summer traffic begins on the east coast route.

SOME time ago we referred to a paper in which Dr. Daniel G. Brinton developed the theory that the ancient Etruscans were an offshoot or colony of the Libyans or Numidians of Northern Africa—the stock now represented by the Kabyles of Algeria, the Rifians of Morocco, the Touaregs of the Great Desert, and the other so-called Berber tribes. This paper Dr. Brinton has followed up by another, in which he compares the proper names preserved in the oldest Libyan monuments with a series of similar names believed to be genuine Etruscan. The resemblances in many cases are certainly striking, and Dr. Brinton's ideas on the subject deserve to attract the attention of scholars.

AT a meeting of the Royal Botanic Society on Saturday, reference was made to a very interesting collection of seeds of economic and food plants, timber trees, &c., of Uruguay, presented by Consul Alex. K. Mackinnon. On the table were plants in flower of *Narcissus poeticus*, lately received from China, and several varieties of the same flower from the Scilly Isles, illustrating the cosmopolitan nature of this family of plants. In the Scilly Isles narcissi are grown by the acre, and over ten tons of the flowers are sent off weekly to market.

IN the current number of the *Revue des Sciences naturelles appliquées*, M. Mégnin has a valuable paper on the existence of tuberculosis in hares. About two years ago he described a peculiar disease brought on by the presence of some species of *Strongylus* in the lungs of hares. The disease dealt with in the present paper is wholly different.

M. H. BEAUREGARD, *aide-naturaliste* in the Paris Museum of Natural History, has published an elaborate monograph on the Vesicant tribe of insects. It is illustrated by many fine plates.

THE skeleton of a mammoth has been discovered in the Russian province of Tula, and the Moscow Society of Naturalists have sent a commission to excavate it.

MESSRS. MACMILLAN AND CO. are issuing a thoroughly revised edition of "A Treatise on Chemistry," by Sir H. E. Roscoe, F.R.S., and C. Schorlemmer, F.R.S., and have just published Part II. of Vol. III., dealing with the chemistry of the hydrocarbons and their derivatives. Since this part of the work was published in 1884, many additions have been made to our knowledge of this department of organic chemistry; and the authors, as they themselves explain, have sought to represent the present position of the science by introducing the results of the latest and more important researches, with the effect that the greater part of the volume has been re-written.

MR. JOHN MURRAY has published the nineteenth edition of "The Reign of Law," by the Duke of Argyll.

THE *Amateur Photographer* has issued its fourth "home portraiture number." It reproduces one photograph each from the work contributed by sixty competitors for prizes.

IN the Report of the U.S. Commissioner of Education for the year 1887–88 it is stated that 48 educational institutions in the United States receive the benefit of the national land grant of 1862. Among these institutions are the Arkansas Industrial University, the State Agricultural College at Colorado, the Maine State College of Agriculture and the Mechanic Arts, the Massachusetts Institute of Technology, the Missouri School of Mines and Metallurgy, and the Scientific School of Rutgers College. In 38 of the Colleges an officer of the Army or Navy is detailed to act as professor of military science and tactics. If a State has more than one school endowed by the national land grant of 1862, the school which is reported by the Governor of the State as most nearly meeting the requirements of existing law is held to have the first claim to the officer allotted to the State.

M. A. ANGOT, of the French Meteorological Office, has published in the *Annales* of that office a very careful discussion of the diurnal range of the barometer, based upon the best available data for all parts of the globe. After having given the mean range for each month and for the year, he has calculated the amplitudes and phases of the first four simple harmonic oscillations into which the complex oscillation of the barometric diurnal range may be resolved, and which may be considered as the resultant of the superposition of two waves of different origin and character. One of these, which the author terms the thermic wave, is of a more or less complicated form in appearance, and is easily explained as being produced by the diurnal variation of temperature and by the differences that this variation presents between neighbouring stations. The other, the principal semi-diurnal wave, for which he has given the numerical law, presents a much more simple form, and is not at all affected by local conditions. It is possibly produced by the calorific action of the sun upon the upper strata of the atmosphere; but, as the author states, this is still only an hypothesis, and the theory of this part of the phenomenon remains to be established. His conclusions upon the effect of the thermic wave are very interesting, and the whole discussion will well repay a careful study.

MR. T. W. BAKER writes to us that, in his note regarding the meteor of March 3, he omitted to state the time of its appearance, which was 7.28 p.m.

AN important paper upon the crystalline allotropic forms of sulphur and selenium is contributed by Dr. Muthmann, of Munich, to the latest number of the *Zeitschrift für Krystallographie*. Besides the well-known rhombic pyramids and monoclinic prisms, sulphur may, under certain conditions, be obtained in a third crystalline modification, which has been termed by Gernez "*soufre nacré*." This third modification has been fully investigated by Dr. Muthmann, and, in addition, a new fourth totally distinct variety has been discovered. The third form is best obtained by boiling about five grams of powdered sulphur with 750 c.c. of absolute alcohol in a flask provided with an inverted condenser for one hour, filtering through a warmed funnel into a large flask heated to 70° C. in a water-bath, and allowing the alcohol to slowly evaporate. After about twelve hours a large deposit of brilliant tabular crystals is formed. Similar crystals of the third variety may be obtained by agitating a saturated alcoholic solution of ammonium sulphide with excess of powdered sulphur, filtering, diluting with a little alcohol and allowing to stand in a loosely covered cylinder. In a few hours crystals are found deposited, often measuring a couple of centimetres in length and 1–2 mm. thick. Another method which yielded very beautiful crystals of this modification consisted in allowing a solution of acid potassium sulphate to slowly diffuse into a solution of sodium thiosulphate. In about four weeks' time, perfect crystals, almost white in appearance, and exhibiting strongly the mother-of-pearl lustre, were obtained. This third variety of sulphur also crystallizes in the monoclinic system. The ratio of its axes is $a : b : c = 1{\cdot}0609 : 1 : 0{\cdot}7094$. The axial angle $\beta = 88° \; 13'$. The symmetry plane, $b = (010) \infty \grave{P} \infty$, is so largely developed as to give the crystals the appearance of plates. At the edges of the plates the two primary pyramids $(111) - P$ and $(\bar{1}11) + P$, a prism $(210) \infty P 2$, and a clinodome $(012) \frac{1}{2} \grave{P} \infty$ are well developed. These crystals are totally distinct from those of the second modification; the axial ratios of the latter are $a : b : c = 0{\cdot}9957 : 1 : 0{\cdot}9998$ and $\beta = 84° \; 14'$. Upon the sides of the vessel containing the alcoholic ammonium sulphide solution prepared as above, Dr. Muthmann noticed curious tabular crystals of hexagonal section, which immediately became altered upon contact with a disturbing body, such as a platinum wire or glass rod. They were likewise found to consist of pure sulphur, and, on optical and goniometrical examination, were found to consist of a distinct fourth modification, also monoclinic. They greatly resemble a rhombohedron with predominating basal plane. They are best obtained by allowing to slowly evaporate in a tall cylinder a saturated solution of sulphur in alcoholic ammonium sulphide diluted with four times its volume of alcohol. The temperature during this crystallization must not exceed 14° C. Occasionally in this experiment all four forms of sulphur are obtained; the surface is covered with crystals of the third variety, tables of the fourth modification are deposited upon the sides, and the base of the cylinder is spangled with rhombic pyramids interspersed with monoclinic needles of the second form. If crystals of the third variety are suspended in their mother liquors and left for some days, they are converted into a voluminous mass of minute rhombic pyramids. The conversion into the more stable rhombic form is almost instantaneous if a rhombic crystal be dropped into the liquid containing suspended third variety crystals. The immediate alteration of crystals of the fourth kind is even more remarkable, the mere movement of the cover-glass, when examining them under the microscope, being sufficient to instantly change the optical properties to those of the rhombic form. It is interesting that this fourth form of sulphur is isomorphous with the form of selenium obtained by evaporation of a hot saturated solution in carbon bisulphide.

THE additions to the Zoological Society's Gardens during the past week include two Badgers (*Meles taxus*) from Ireland, presented by Mr. P. Bicknell; a Grey Hypocolius (*Hypocolius ampelinus* ♂) from Scinde, presented by Mr. W. D. Cumming; a Rhesus Monkey (*Macacus rhesus* ♂) from India, a Spotted Ichneumon (*Herpestes nepalensis*) from Nepal, deposited; an Axis Deer (*Cervus axis*), born in the Gardens.

OUR ASTRONOMICAL COLUMN.

OBJECTS FOR THE SPECTROSCOPE.

Sidereal Time at Greenwich at 10 p.m. on March 13 = 9h. 25m. 55s.

Name.	Mag.	Colour.	R.A. 1890.	Decl. 1890.
			h. m. s.	° ′
(1) G.C. 1861	—	White.	9 25 47	+21 58
G.C. 1863	—	White.	9 25 58	+22 0
(2) 8 Leo Minoris ...	5·7	Reddish-yellow.	9 24 51	+35 35
(3) ι Hydræ	4	Whitish-yellow.	9 34 12	− 0 39
(4) o Leonis...	4	Yellowish-white.	9 35 18	+10 24
(5) 132 Schj.	Var.	Red.	10 32 7	−12 25